1. INTRODUCTION TO SOFA UPDATE

1.1 Purpose

Formed in February 1998, the SOFA Working Group (SWG), made up of railroad industry representatives, has undertaken a number of activities since the release of its *SOFA Report: Findings and Recommendations of the SOFA Working Group*, in October 1999. That report was based on the review of 76 fatalities that occurred to railroad employees engaged in switching operations from January 1, 1992 through July 1, 1998.

The SWG activities have been directed towards achieving the goal of Zero Switching Fatalities:

- reviewing the 48 switching fatalities that occurred through December 2003, since the 76 fatalities upon which the *SOFA Report* was based;
- drawing the attention of those engaged in switching operations to the Five Operating Recommendations made in the *SOFA Report*;
- identifying 'Special Switching Hazards' such as close clearance, being struck by mainline trains, and shoving that resulted in switching fatalities that were not necessarily preventable by one or more Operating Recommendations;
- studying Severe Injuries, such as amputations, that cause harm to employees engaged in switching operations; and
- publicizing information about the number and types of switching fatalities and Severe Injuries.

In serving as an update, this report describes SWG activities. These activities are important because through December 2003, there have been 38 switching fatalities since the release of the *SOFA Report*. Of these 38 fatalities, 17 (45 percent) may have been avoided had the Operating Recommendations been followed. This possibility demonstrates the need for continuing education to reach the goal of Zero Switching Fatalities.

1.2 Origin of the SOFA Working Group

In February 1998, George A. Gavalla, Associate Administrator for Safety of the Federal Railroad Administration (FRA), charged the SWG to: "Conduct a detailed fact-finding review and analysis of these incidents [switching fatalities] to determine whether trends or patterns can be found, identify best practices, and, if possible, formulate recommendations for the entire industry based on the findings." Appendix B contains Mr. Gavalla's letter that includes this charge.

From Mr. Gavalla's charge the SWG was formed, made up of representatives from the FRA, American Short Line and Regional Railroad Association (ASLRRA), the Association of American Railroads (AAR), the Brotherhood of Locomotive Engineers and Trainmen (BLET),[5] the United Transportation

[5] Note: Brotherhood of Locomotive Engineers and Trainmen (BLET) was formerly the Brotherhood of Locomotive Engineers (BLE).

Union (UTU), and the Volpe National Transportation System Center (VNTSC). The SWG held meetings on a nearly monthly basis since its inception in February 1998.

While the organizations represented in the SWG remained unchanged since its inception, some members, because of retirement or new work assignments, have been replaced. As expressed in the acknowledgments, current SWG members wish to recognize the considerable contribution to railroad safety that these former members made.

1.3 History of Switching Fatalities

SWG switching fatality records date back to 1975. Fatalities in the years 1975 through 1982 were relatively higher than in the years following. After 1982, fatalities began to decline, moving within a range of 7 to 15 per year, until 2002 when there were 6 (Figure 1-1). However, in 2003 fatalities increased to 10. There have been 4 switching fatalities through June 2004.

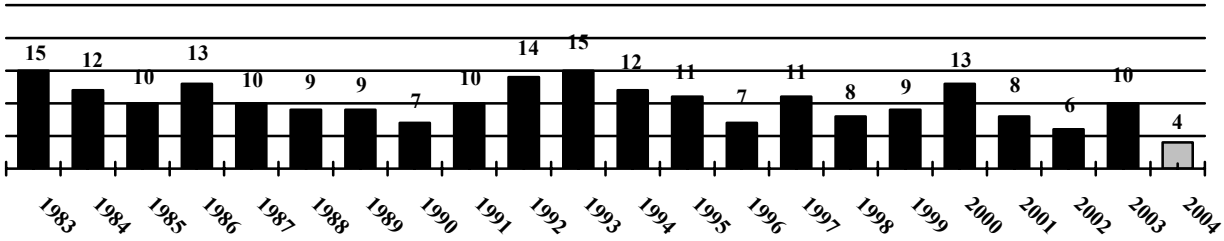

Figure 1-1. Switching Fatalities, 1982 through June 2004

The necessity for immediate, preventive action is implied by the 21 years of fatality counts shown in Figure 1-1. On average, back to 1983, 10.4 employees died each year in switching operations. Equivalently, on average 2.6 employees died every three months.

1.4 Operating Recommendations and The Five Lifesavers

In its *SOFA Report* the SWG made Five Operating Recommendations based on a review of 76 fatality cases that occurred from January 1, 1992 through July 1, 1998. The SWG believes these Recommendations, each based on between 8 and 12 fatality cases, if used when appropriate in switching operations, will prevent fatalities. The Five Operating Recommendations are shown in Appendix D. Subsequently, the SWG developed shortened versions of each Recommendation that may involve a series of steps. These shortened versions came to be known as:

The Five Lifesavers

- Secure equipment before action is taken.
- Protect employees against moving equipment.
- Discuss safety at the beginning of a job or when a project changes.
- Communicate before action is taken.
- Mentor less experienced employees to perform service safely.

1.5 Narrative Descriptions of Switching Fatalities

Section 3 contains a short narrative summary of each of the 124 switching fatalities and whether one or more Operating Recommendations applies. These narratives were written by the SWG as part of its review of each switching fatality. In Section 2, the numbers of fatalities that apply to an Operating Recommendations before and after the release of the *SOFA Report* are compared.

1.6 Additional Recommendations

In addition to making Five Operating Recommendations in its *SOFA Report*, the SWG made Additional Recommendations concerning:

- Unexpected train movement
- Crew resource management
- Review of Severe Injuries
- Maintenance of the SOFA Matrix
- Computer support for fatality investigation
- Continued review and monitoring of switching fatalities
- Team-oriented approach to switching fatality investigation

'Additional Recommendations' are for the most part recommendations not involving switching operations directly (unexpected train movement being the exception) that the SWG believes, nonetheless, will help reduce risk in switching operations and facilitate the collection of fatality information. These Additional Recommendations are described verbatim below, from the *SOFA Report*:[6] (Note: the abbreviation 'FE' in the cited material stands for 'fatality of an employee.')

Safety Training Concerning the Implications of Unexpected Train Movement

Finding: Compelling evidence suggests many fatalities resulted from unexpected train movement, particularly at very low speeds.

Action: The railroad industry should consider their existing switching operations training programs to assure that no opportunities are being overlooked to heighten safety awareness and to focus it on the

[6] The *SOFA Report: Findings and Recommendations of the SOFA Working Group*, October 1999, page 4-16, Section 4.2.2.

serious implications of unexpected train movement, and on the importance of continual mutual awareness of the location and activities of all crew members.

Rationale: Such FEs are preventable if the crew members have proper understanding of all planned movements, take care to be sure that no individuals are exposed to potential hazards at the time movements are initiated and to assure that detached equipment has been properly protected, i.e., locomotive reverser centered or hand brakes applied, to prevent unplanned movement. Safety awareness training can encourage a strong focus on these issues.

Train Crew Resource Management

Finding: The Working Group has also concluded that an important contributing factor to many of the FEs reviewed was incomplete or inadequate communication among crew members. Sometimes this was a failure of, or improper use of communications equipment, but more often it was a failure or reluctance of the crew member to elevate the importance of communications impacting on safety to the level needed to assure successful, safe operations.

Action: The industry (labor, management, FRA) should consider programs that address improving crew coordination and communication such as Crew Resource Management (CRM) that has been used effectively in the aviation industry.

Rationale: The goal of these training procedures in all industries is to promote safe operations through improved crew member proficiency, situational awareness, effective communication and teamwork, and by providing strategies for appropriately challenging and questioning authority where safety could be jeopardized. Training in the importance of and procedures for effective intra-crew communication has the potential to make a major contribution to the safety of switching operations.

Follow-on SOFA Analysis: Review of Incidents Involving Severe Injury

Finding: The SOFA Working Group has been an effective task force for accomplishing goals that span the interests of labor, management and the FRA in switching operations. Although the review of switching fatalities has been very useful, the body of data is relatively small. Incidents in which serious injury has resulted, such as loss of a limb or requiring that the employee be placed on extended disability are likely to be very similar in kind to FEs. They are likely to reflect the same safety implications in the sense that the only difference is in the degree of severity of the injury.

Action: The SOFA Working Group or its successor should extend the scope of its investigations by undertaking the review of available FEs where severe injuries have resulted.

Rationale: The data collection procedures for examining railroad injuries has recently been improved so that more complete and useful data for understanding the safety implications are available. In 1998 there were more than 8,000 non-fatal railroad incidents, not including grade crossing incidents. While we do not know the number of these that would be classified as serious and the number that involved switching operations, it is likely to be a significant proportion of this total and therefore would substantially augment the statistical reliability of the aggregate database and the ability to make objective recommendations based on it.

Establish and Maintain Database of Objective FE Data

Finding: FRA's existing FE files could be greatly improved by including a much broader range of information that can support the interpretation of the possible contributing factors associated with FEs.

Recommendation: When investigating FEs, the FRA should establish a comprehensive historical database summarizing the objective data and interpretation of FEs occurring in switching operations that will be updated regularly to accumulate reliable and consistent information about the occurrence of switching operations fatalities.

The Working Group, taking advantage of the insights resulting from its extensive analysis of existing data, is providing its recommendations for ensuring that specific data are collected by the FRA during its investigation of FEs.

Discussion: The generated database will provide more reliable clues to the factors contributing to switching operations FEs and support the justification of safety improvements in terms of the number of lives potentially saved. Additionally, the newly generated database will substantially reduce the time and cost of subsequent analyses and recommendations.

Recommendation for Providing Computer Support to the Data Collection Process

Finding: Current data collection procedures involve use of printed forms, notes, diagrams and photographs that do not provide a thorough or uniform data collection to perform accurate statistical analyses.

Recommendation: The FRA should consider creating software to facilitate data entry at the source and at the time the investigation is taking place. This software could operate on portable laptop computers already available to investigators or on off-the-shelf personal data units (PDUs) that are especially suited to the data collection application. The SOFA Working Group offers its assistance in a project to revise the data collection protocol and to develop software to support the fatality investigation and data codification process.

Discussion: The efficiency, accuracy, and thoroughness of the existing data collection in each investigation would be improved. Computer support could reduce the time and cost associated with the complete data collection and consistent codification process.

Recommendation for Continued Review and Monitoring of Fatal Accident Data

Finding: The SOFA Working Group has accumulated the most knowledge of the potential causes of switching operation FEs in the industry.

Recommendation: The SOFA Working Group, or its successor, should undertake a periodic review of the FE switching operations data as it accumulates to seek new lessons learned, to review the integrity of the data, to monitor its usefulness and recommend improvements to the data being collected where appropriate.

Discussion: Their review of the data will (1) provide the best checks that the data being requested are useful; (2) put them in a position to recommend improvements to data collection; and (3) put them in a position to recommend potential safety improvements to reduce the incidence of death and injury.

Modification of FRA's Data Collection Process to Include a Team Concept

Finding: No one has all the expertise required to undertake a comprehensive review and revision of FE investigation procedures.

Recommendation: The Working Group believes it is important that FRA's investigation process be consistent, and that a team concept be implemented to insure complete data collection.

Rationale: The SOFA Working Group recognizes that some inspectors collect and produce reports better than others, while other inspectors are more versed in analyzing the FE data. A team (to include all affected disciplines) concept in data collection and analysis will insure a more consistent FE investigation.

The above material was taken from the *SOFA Report: Findings and Recommendations of the SOFA Working Group*, on October 1999, Section 1.4.

1.7 SOFA-defined Severe Injuries

In addition to reviewing each switching fatality, the SWG monitors the number and type of Severe Injuries to employees engaged in switching operations. 'Severe Injuries' were defined by the SWG to include injuries that are (1) potentially life threatening; (2) having a high likelihood of permanent loss of function; (3) likely to result in significant work restrictions; and (4) caused by a high-energy impact to the human body. An anatomical definition, along with a discussion of Severe Injuries, is presented in Section 5.

The SWG reviewed Severe Injuries because it felt the causes were similar to those of fatalities. However, the information necessary to determine that relationship does not exist. Severe Injuries are not normally investigated by the FRA, while fatalities to employees on duty are required to be investigated.

As shown in Figure 1-2, Severe Injuries declined in 2002 and 2003 from the almost similar counts of the previous five years. Severe Injury counts are not available before 1997 when FRA FORM F 6180.55a was revised. (By comparison switching fatalities declined in 2002 to a historic low, but increased in 2003 as shown in Figure 1-1.) There were 123 Severe Injuries in 2002; and 116 in 2003. The 116 Severe Injuries in 2003 were the lowest value in the seven-year period, 1997 through 2003.

Compared to the previous five years, amputations declined in 2002 and 2003. Amputations are a subset of Severe Injuries and are shown separately because of the acute trauma involved. Most Severe Injuries are fractures of the worst kind, fractures to fingers and toes being excluded by the SWG from the definition of Severe Injuries.

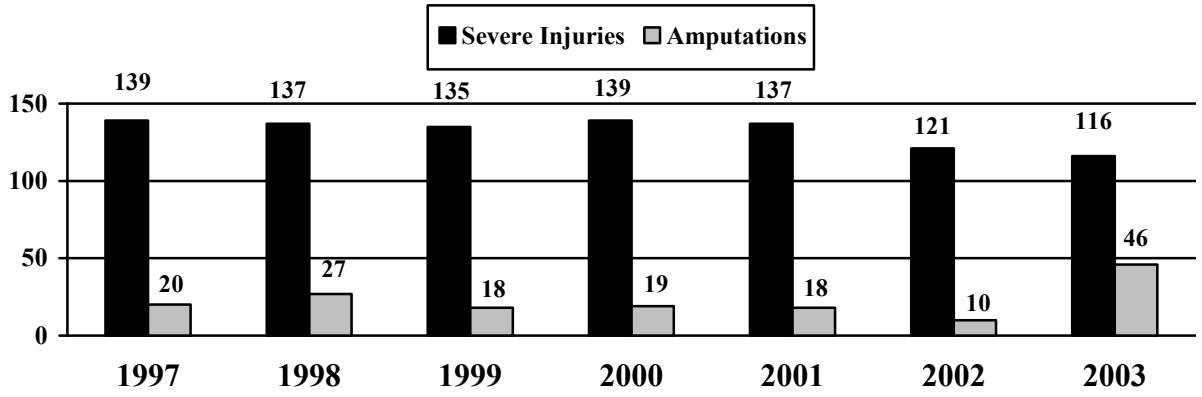

Figure 1-2. SOFA-defined Severe Injuries and Amputations, 1997 through 2003

1.8 Summary of Report Contents

The remainder of this report consists of four sections, an appendix, and data appendix:

Section 2: SOFA Working Group Activities. A discussion of SWG activities since the publication of the *SOFA Report* in October 1999.

Section 3: Switching Fatalities. A complete list and description of the 124 switching fatalities that occurred from January 1992 through December 2003. The fatalities are classified by Operating Recommendations if one or more applies. Or, if no Recommendation applies, by type of event or characteristic.

Section 4: Switching Fatalities – Understanding and Prevention. An accounting system for classifying the 124 fatalities for understanding and prevention.

Section 5: SOFA-defined Severe Injuries. Severe Injuries by various characteristics and track location.

Appendix:

A: SOFA Implementation Guidelines for Operating Recommendations

B: Origin of SOFA Working Group

C: Original Introduction *to SOFA Report*, October 1999

D: Five Operating Recommendations

E: Obtaining Electronic Versions of SOFA Reports

F: Examples of Job Briefings – Operating Recommendation 4

Data Appendix

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